

## **Nubian Cluster Analysis Summary September, 2014**

Data was obtained from the ADGA for 8 dairy breeds. All results were limited to those animals reported as Purebred (PB) or American (AM); however, all animals were included in the pedigree analysis to establish ties between animals, including cases where the ancestors are from another breed. Cluster analysis is a procedure that groups related animals based on pedigree relationship. This is a technique used by NAGP to assess where repository animals are grouping with the currently available genetic pool for each breed. It also establishes a practical approach for obtaining animals for the repository in a way that maximizes genetic diversity. Animals that were included in the cluster analysis were limited to sires of at least three PB and AM offspring born 2011 to present that are also PB or AM themselves. Repository bucks are also included in the clusters.

Table 1 shows the summary statistics based on the pedigree and cluster analyses.

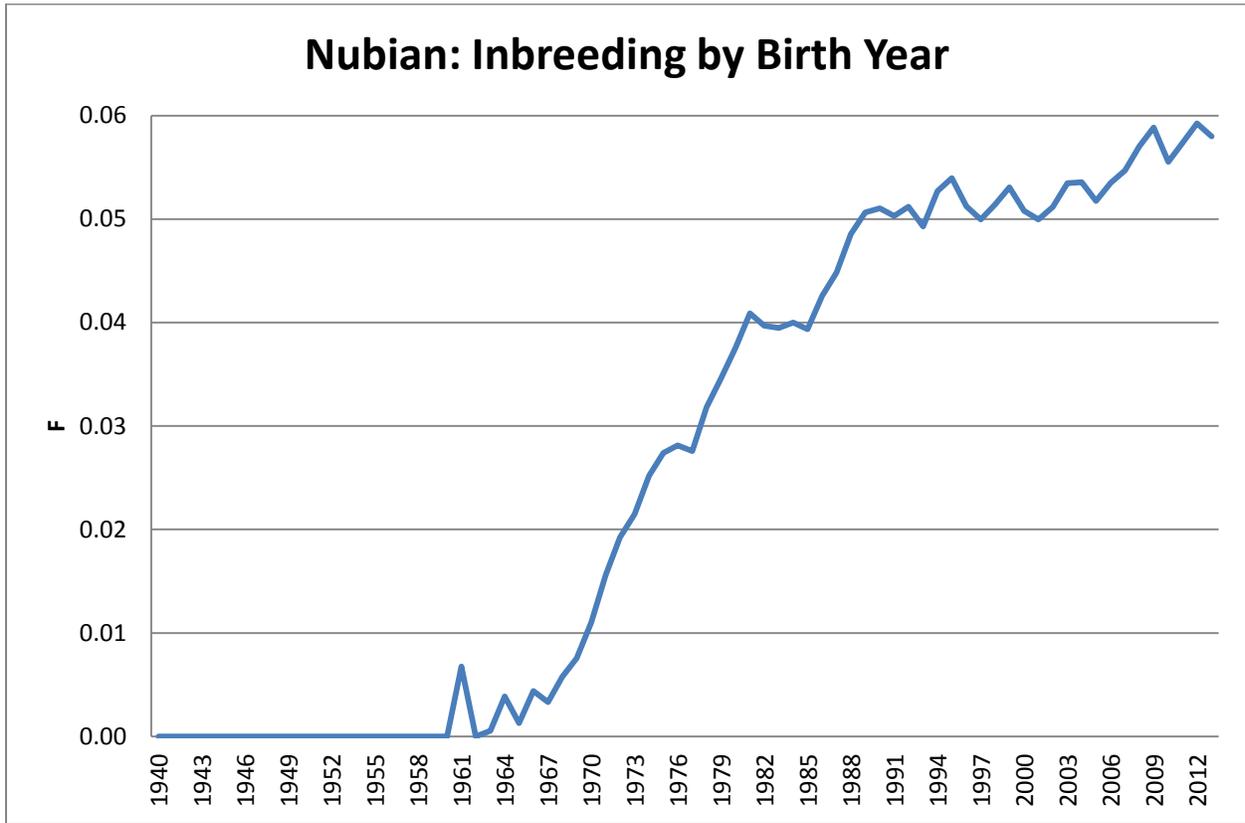
Table 1. Summary statistics for Nubian

	Nubian
Animals that are PB or AM	515,364
Full pedigree file (until all ancestors are unknown)	542,202
Unique sires	59,198
Unique dams	189,585
Mean inbreeding (F)	0.047
F range	0 – 0.61
Repository bucks	14
Clustered bucks	3,374

### **Pedigree & Inbreeding Analysis**

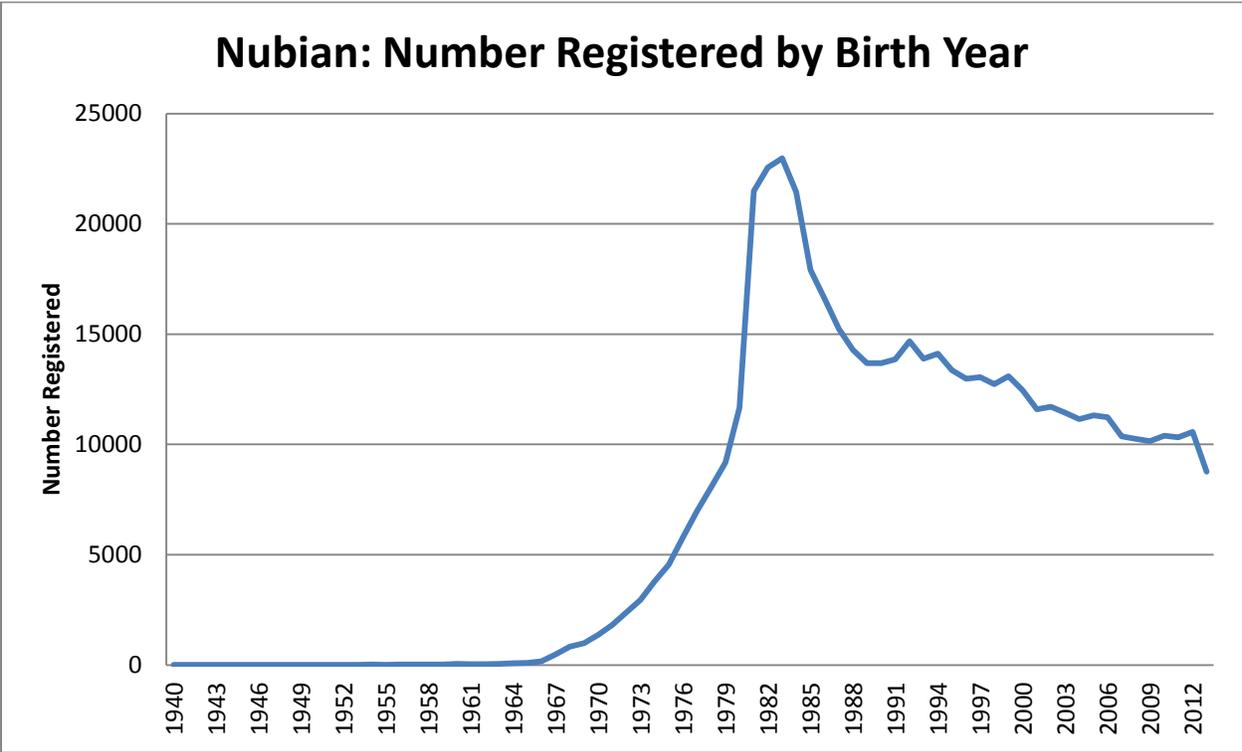
The inbreeding trend over time for Nubians remains relatively low, and is currently less than 6%, as plotted in Figure 1. The inbreeding trend has increased by less than 1% in more than 20 years.

Figure 1. Nubian inbreeding trend by birth year



Number of registrations have declined over time, to less than half of what they were at their peak in the early 1980's. Despite this, Nubians have the most registrations of any dairy goat breed in the U.S.

Figure 2. Nubian goats registered by birth year



Although overall inbreeding levels remain low for Nubians, almost every animal has some inbreeding accumulation, as shown in Figures 3 and 4.

Figure 3. Percent of Nubians with an inbreeding coefficient greater than zero by birth year

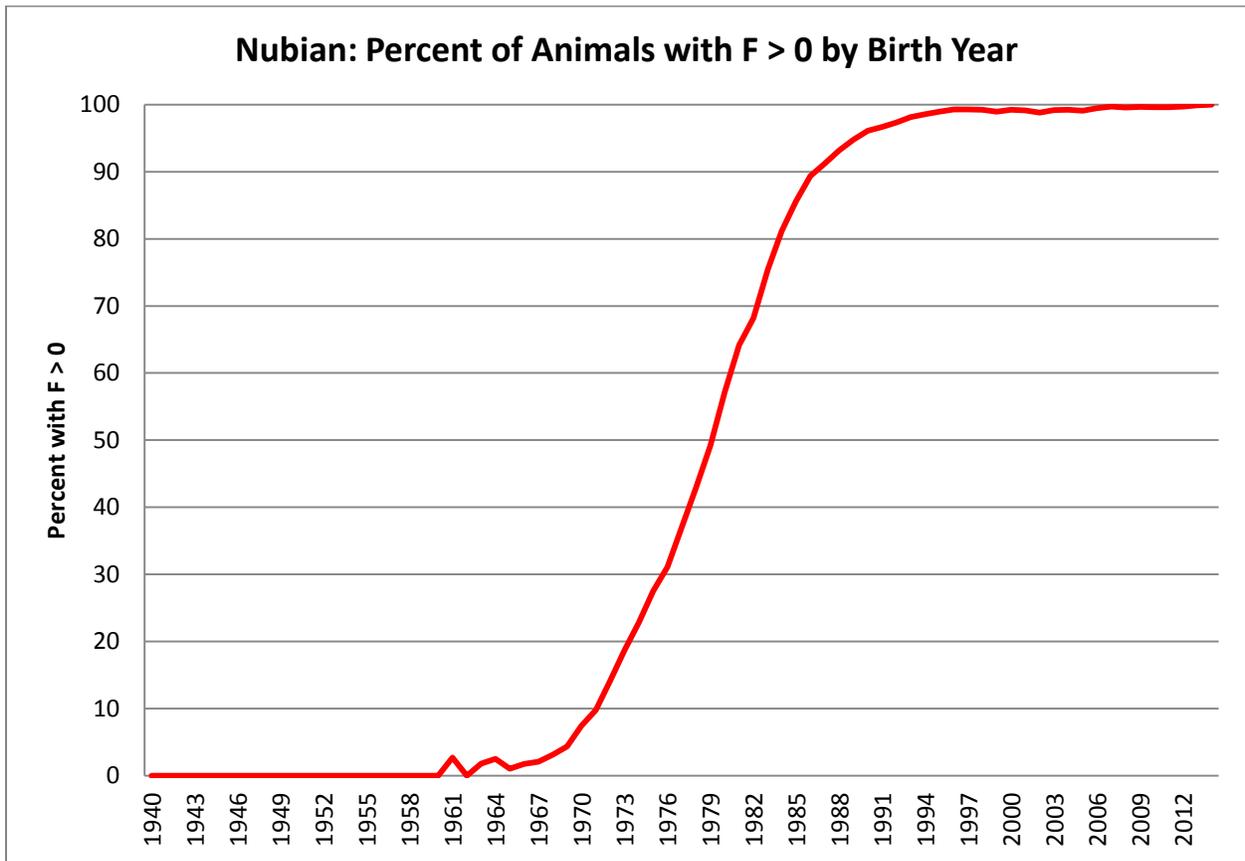


Figure 4. Percent of Nubians born 2009 and later by inbreeding category

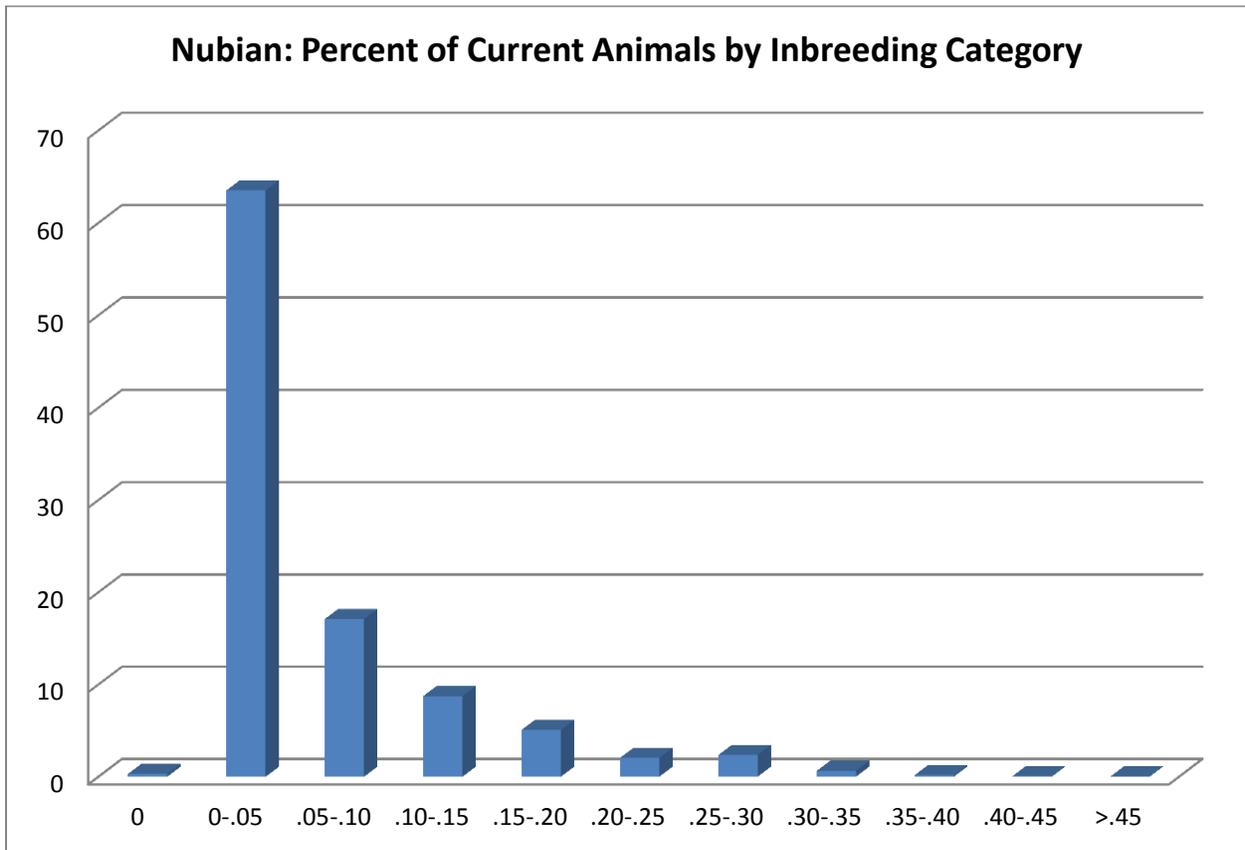
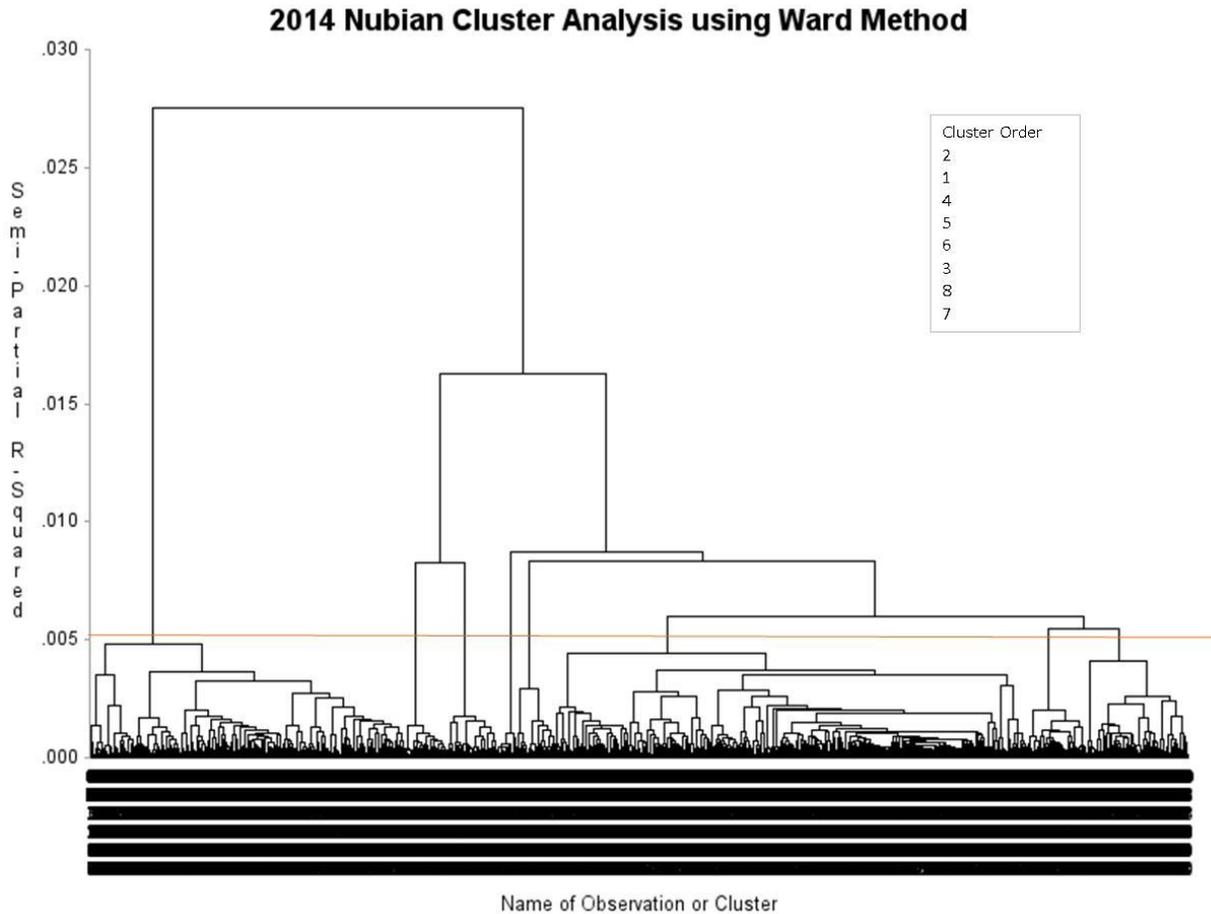


Figure 5 illustrates the tree diagram for the 8 clusters resulting from the Nubian cluster analysis.

Figure 5. Tree diagram for Nubian cluster analysis of sires of three or more PB and AM offspring born 2011 and later that are PB or AM themselves (gold line depicts cluster level)



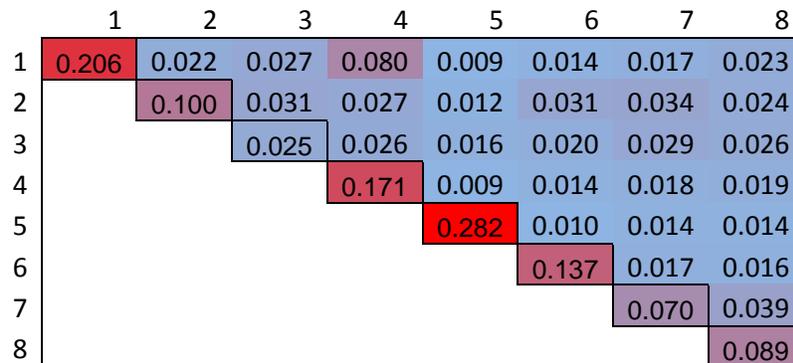
In Table 2, the within and between cluster relationships are presented. Due to the low overall relationship (0.034) of the 3,374 clustered bucks, it is difficult to identify highly related groups. The largest cluster has 1,450 bucks with an average relationship of 0.025, which is even lower than the overall average relationship. This suggests that sampling across the breed should add genetic diversity to the repository without much targeted sampling. Repository bucks are represented in 2 clusters; twelve of the bucks belong to the very low relationship cluster.

Table 2. Nubian cluster results showing the number, mean, and variance for between and within cluster relationships in addition to repository bucks

Between Clusters				
	n	Mean	Variance	
	3374	0.034	0.001	
Within Cluster				
	n	Mean	Variance	Bucks in Repository
Cluster 1	137	0.206	0.011	
Cluster 2	966	0.100	0.004	2
Cluster 3	1450	0.025	0.001	12
Cluster 4	147	0.171	0.009	
Cluster 5	60	0.282	0.016	
Cluster 6	120	0.137	0.010	
Cluster 7	309	0.070	0.004	
Cluster 8	185	0.089	0.006	

Figure 6 shows the cluster relationship matrix for the within and between cluster relationships. The between cluster relationships are low and the within cluster relationships range from low (0.025) to moderately high (0.282).

Figure 6. Within and between cluster relationship matrix for Nubian



The genetic trends for Milk, Fat, and Protein PTA are shown along with the repository bucks in Figures 7, 8, and 9, respectively. The repository bucks show a large range of PTA for all traits, both below and above average, suggesting good genetic diversity of the breed represented in the repository thus far.

Figure 7. Nubian genetic trend for Milk PTA compared to repository bucks

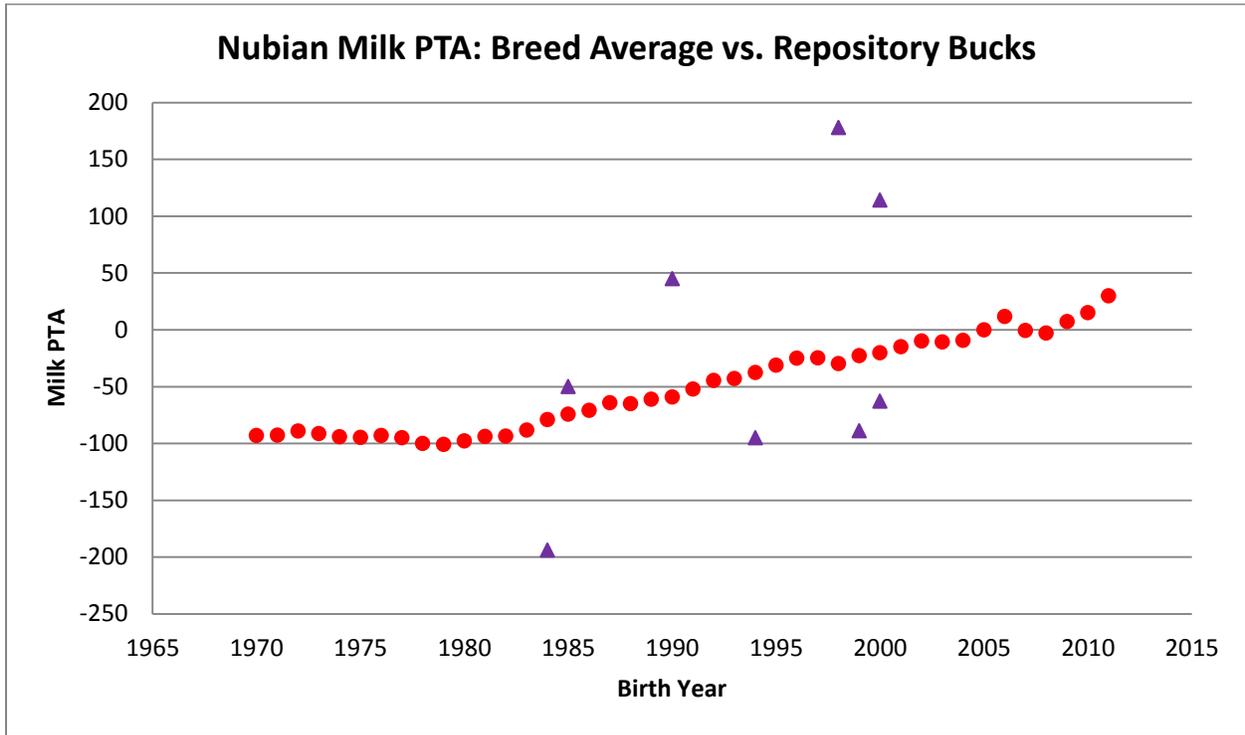


Figure 8. Nubian genetic trend for Fat PTA compared to repository bucks

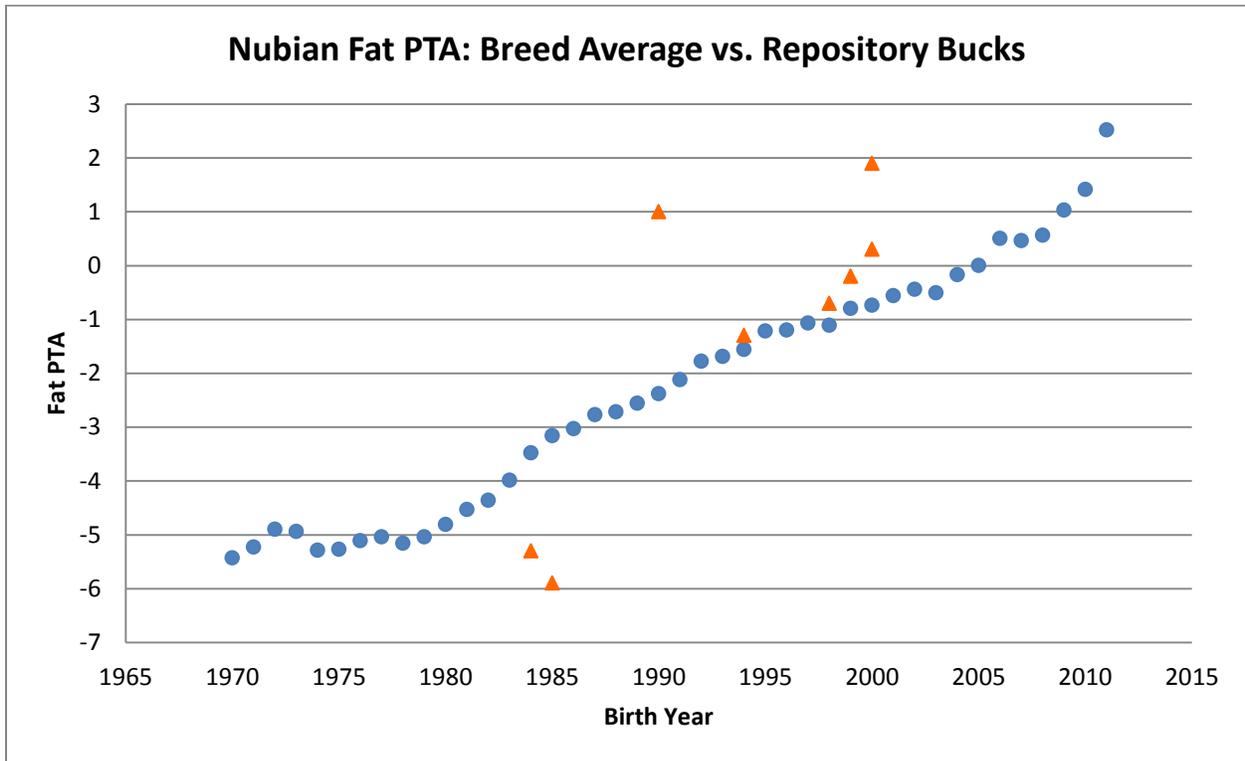


Figure 9. Nubian genetic trend for Protein PTA compared to repository bucks

